HEADS UP!

GOT SNOW?

Consideration of Winter Conditions in Home Inspection

Modern design standards use ground snow load records and accepted safety factors to engineer house structures for high reliability. This is because snow load on structures is a principal cause of structural collapse. Most homes in our area are designed to support a 20-pound snow-load. This loading can be exceeded by less than 2' of snow! We are encountering more frequent extreme winter weather events. The Buffalo, NY area has had multiple recent incidents of snow accumulation of 4-6 feet! Inspecting for structural weaknesses that may make a home susceptible to damage from winter conditions and educating your Client to understand the threat of heavy snow and ice on their home may save lives and help safeguard against catastrophic property loss.

Warning Signs of Structural Failure - Heavy snow/ice accumulation often causes cracks in the finishes of walls and ceilings and causes doors and windows to bind. These conditions should be investigated by a professional inspector. Hearing loud cracking noises during a high accumulation event is a danger sign.

Snow depth- The density of 1 ft.^{2} of snow is about 1 to 1.5 pounds. It is important to know however, that snow accumulation becomes increasingly dense with depth. The weight of a square foot of snow 6" deep is about 7.5 pounds. The weight of 48" of snow is eight times that (~60 lbs). However, snow compacts as it accumulates so the design weight used in engineering for 4 feet of snow is 117 psf!

Wet Snow - Snow has varying liquid water content and some accumulated snow can be very heavy when the water content is high. Cold fluffy snow may weigh around 7 psf. Really wet snow can weigh 4 times that. Rain falling on accumulated snow is also a condition of concern as the density of the accumulation and the resulting weight on structures can rise dramatically in a short period of time before the snow has an opportunity to melt.

Raftered Roof Structures - The strength of a rafter roof system depends not only on the dimensions, spacing and condition of the rafters, but also on their connections at top and bottom. Rafters should be directly opposed and tied together against separation with collar ties at maximum 4' on center. Equally important is the connection of the rafters below. Perhaps the strongest connection is when the opposing rafter bottoms are fastened to an attic floor structural member running between them creating a stable triangle. Potentially weak conditions can arise in attics when rafters bear on an exterior attic wall above attic floor level and there is no structural member directly tying the opposing rafter bottoms together. Symptoms of this condition are bellied ridgelines and bulging of the eave line.

Truss Roof Structures - Trusses should be installed according to an engineered design that is not likely available at the time of inspection. However, the installation should be checked for common issues that can result in structural weakness. These include removal or modification of truss web components, rot or other damage to any part of a truss, substandard lumber with knots or other defects, inadequate connection to exterior walls, etc.

Roof Deck Issues - Check for sag between rafters that can result from things such as missing H-clips, span exceeding the rating of sheathing (check the stamp), moisture damage from leaks or poor attic ventilation, sheathing installed in the

wrong orientation (the long dimension should be parallel to the eaves for strength), etc. Decks can fail from heavy loads especially from the added weight of persons doing snow removal.

Unbalanced Loads - Roof structural integrity can be jeopardized when one side of the roof has a substantially greater load than the other. This is an especially important consideration in events of heavy accumulation of snow/ice. Winds can cause one side of a roof to be bare while at the same time depositing heavy snow loads on the other. If both sides of the roof have heavy snow loads requiring removal, it is important to balance the removal so that the snow load on one side is not much greater than the other.

Snow Removal - Heavy snow loads may need to be removed to protect a home. This can be a dangerous endeavor from things such as ladder accidents, slippery roof surfaces, sliding snow loads, etc. Roofs can also be damaged resulting in need for repair and/or leaks. Great caution should be used, and consideration given to hiring that work out to a qualified contractor. When removing snow, it should not be scraped down to the roof surface. The important thing is to remove weight. It is generally best not to chip ice, but rather, to get the snow off of it so it has a chance to melt.

Low Pitch - Steeper roofs tend to hold less snow than those with low pitch (generally below 4:12). Special attention should be paid to the structural integrity of low slope roof areas. Ledger attachment, rafter connections, rafter dimensions, etc. should be given close scrutiny.

Sliding Snow Loads - Snow loads, especially on metal roofs, can slide in a mass and be very dangerous and damaging. Metal roofs should have roof jacks to resist sliding snow. In the condition where a steeper slope roof discharges onto a low slope roof below, a heavy sliding snow load may structurally damage the lower roof potentially leading to collapse. Persons can be seriously injured, and substantial property damage can result from sliding snow loads.

Ice Damming - Lack of adequate attic ventilation and attic floor insulation can be very damaging to a home and contribute to accumulation of heavy snow and ice loads. Properly constructed attics have a continuous flow of air along the underside of the roof deck and insulation in the attic floor adequate to prevent excessive heat rising to the underside of the roof deck. This results in the underside and the top side of the roof being at approximately the same temperature so that snow is less likely to stick to the cold roof surface and accumulate, and when it does accumulate is less likely to melt. Poor ventilation and insulation results in the eaves being much colder than the roof surfaces above the heated spaces. Snow melts in the upper heated areas and runs down to the eaves where it encounters the cold condition and freezes. Ice continues to the build up there and that ice works its way into the roofing materials and structures often causing serious damage. Keep in mind the requirements for adhered roofing underlayment that is designed to protect against this. Ice is also heavy, imposing potentially damaging loads at the eaves and the growth of sometimes enormous icicles that not only can cause major damage to the soffits, gutters, etc., but also pose an imminent hazard to persons and property. Removing large accumulations of ice is dangerous in many ways.

Inaccessible Fuel Shut-Offs - Large accumulations of snow and ice coming off the eaves of the roof can cover exterior shut off valves on natural gas feeds to homes and can cover propane and fuel oil tanks. Location of these items below the eaves of a roof is a poor choice that should be reported. Clients should be reminded of the importance of maintaining access to fuel shutoffs in case of emergency.

Iced-over Natural Gas Regulators - Regulators on natural gas supplies to homes act to vent overpressure gas to the exterior environment through the screened outlet in the regulator. If regulators become iced over or buried in heavy snow they may cease to provide protection against overpressure gas to the appliances in the house which can be very hazardous. Make sure your Clients understand how important it is to keep the area around a gas regulator clear.

Share this information with your Client during a Home Inspection, <u>even in the Summer!</u>

…and don't forget to point out the vigilant winter maintenance required by steep driveways.